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NEWS REPORT

National Academy of Sciences National Research Council

VOLUME VIII *January–February 1958* NUMBER 1

The Satellite Program of the International Geophysical Year

HUGH ODISHAW, *Executive Director*

United States National Committee, International Geophysical Year

INTEREST in the use of earth-circling artificial satellites as research tools during the International Geophysical Year (IGY) was first expressed by the Special Committee for the IGY (CSAGI) of the International Council of Scientific Unions in a resolution adopted on October 4, 1954, which states:

> In view of the great importance of observations during extended periods of time of extraterrestrial radiations and geophysical phenomena in the upper atmosphere, and in view of the advanced state of present rocket techniques, CSAGI recommends that thought be given to the launching of small satellite vehicles, to their scientific instrumentation, and to the new problems associated with satellite experiments, such as power supply, telemetering, and orientation of the vehicle.

The Executive Committee of the U. S. National Committee for the IGY decided that an instrumented satellite program was both feasible and scientifically desirable. On March 14, 1955, the chairman of the National Committee transmitted a resolution to the National Academy of Sciences and the National Science Foundation recommending prompt initiation of a satellite program. This was followed on May 6 by a document covering the proposed scientific and technical program.

The Committee's satellite proposal—calling for sponsorship of the scientific portions of the program by the National Academy of Sciences and the National Science Foundation and for rocket design, construction, and launching by the Department of Defense—was accepted by the Government. On July 29, 1955, the plans of the Committee to launch IGY satellites were transmitted to CSAGI by the Committee Chairman. A simultaneous public statement was issued from the White House.

The U.S.S.R. decision to launch a satellite during the International Geophysical Year was announced at the fourth meeting of CSAGI, held in Barcelona, September 10–16, 1956. The resolutions adopted unanimously at the Barcelona meeting asked that transmitters be compatible with frequencies already announced.

As of February 6, 1958, three satellites had been launched in the IGY satellite program, two by the U.S.S.R. and one by the United States.

The first Russian satellite was put into orbit on October 4, 1957. It is reported to have been launched by a multi-stage rocket from a point north of the Caspian Sea. Announcements on Radio Moscow and

in the Soviet press stated that satellite 1957-α was a polished aluminum sphere weighing 83.6 kg. and 58 cm. in diameter, with four antennae (one pair slightly less than 8 feet in length and the second pair 9.5 feet). The antennae were folded back during launching but sprung into position when the protective nose cone was jettisoned.

The satellite carried two radio transmitters, one operating at 20.005 mc. and the other at 40.002 mc. The radio transmissions carried telemetered data on temperature.

The first United States radio reception of the satellite's signals was reported at 8:07 p.m., October 4, by RCA Communications at Riverhead, L.I. Radio reception was soon general, and reports of almost continuous monitoring were received from many IGY stations, including the Amundsen-Scott South Pole station and Drifting Station A, located on an ice floe less than 500 miles from the North Pole.

The United States Minitrack network, set up to track satellites emitting signals of 108 mc., the frequency originally announced by the United States, was partially adapted for reception and tracking on 20 and 40 mc.

In addition to the satellite itself, both the protective nose cone and the last stage of the launching rocket entered into orbit. All three objects were detected by the radio telescope at Stanford University on October 9. For purposes of reporting sightings the rocket was designated 1957α1, the satellite 1957α2, and the nose cone 1957α3. The numerals refer to relative brightness.

The rocket, much larger than the satellite, was more often seen by visual observers than either the satellite or the nose cone. The first sighting of the rocket in the United States was reported October 10 by a Moonwatch team in New Haven, Conn. ("Moonwatch" is the IGY volunteer visual observation program.)

The orbit of the satellite was elliptical, with an original apogee of about 580 miles and perigee of about 140 miles. The original period was 96.2 minutes. By October 26, the period had decreased to 95.3 minutes. According to Soviet press reports, the satellite "ceased to exist" on January 4, 1958. The rocket is assumed to have fallen on or about December 1, 1957.

The U.S.S.R. launched its second satellite, designated 1957β, on November 3, 1957. The following descriptive text was issued on that date by Tass:

The second artificial satellite developed in the U.S.S.R. represents the last stage of the carrier rocket housing containers with scientific instruments.

The second artificial satellite carries instruments for studying solar radiation in the short wave ultraviolet and X-ray regions of the spectrum, instruments for cosmic ray studies, instruments for studying the temperature and pressure, an airtight container with an experimental animal (a dog), an air-conditioning system, food and instruments for studying life processes in the conditions of cosmic space, measuring instruments for transmitting the results of scientific measurements to the earth, two radio transmitters operating on frequencies of 40,002 and 20,005 kilocycles and the necessary power sources.

The total weight of the apparatus mentioned above, the experimental animal and power sources amounts to 508.3 kilograms (1,120.29 pounds).

According to observations the satellite has been given an orbital velocity of about 8,000 meters per second.

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According to information received from the satellite, the scientific instruments and control of the life processes in the animal are proceeding normally.

Radio signals from the satellite ceased on November 10. On November 13, Pravda published a statement saying,

The program of scientific research connected with taking measurements in the second artificial satellite was planned for seven 24-hour periods. This program has now been completed. The radio transmitters of the satellite, as well as the radio telemetrical instruments on board the satellite have finished their work. Further observations of the second artificial earth satellite, for the purpose of exploring the properties of the upper layers of the atmosphere and forecasting its movements, are being made through optical means and radar.

On February 5, 1958, the Smithsonian Astrophysical Observatory announced that the period of 1957β had decreased to 98.34 minutes from the initial period of 103.7 minutes, the apogee had decreased from 1,056 miles, to 724 miles, and the perigee was 124 miles, very close to the initial value.

The first United States satellite, designated 1958α, was launched from the Cape Canaveral, Fla., at 10:48 p.m. e.s.t. on January 31, 1958. The launching vehicle was the 4-stage Jupiter-C rocket. The first stage was a modified Army Redstone rocket. The second and third stages were composed of clusters of small solid propellant rockets designed by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology. The final stage was one JPL rocket with an added nose section carrying the satellite instruments. The upper stages of the rocket were spin stabilized in order to minimize variations in the direction of thrust if any of the rockets misfired.

The first stage separated from the upper section at an altitude of 53 miles when its fuel was expended. The upper stages coasted to an altitude of approximately 200 miles. At the apex of the arc, when the rocket was horizontal to the earth's surface, the high-speed stages were fired in sequence, increasing the orbital speed of the satellite to approximately 19,000 m.p.h.

The final stage, which carries the instruments, is 80 inches long and 6 in diameter. The instrument payload, carried in a nose cone, weighs about 11 pounds. Four whip-like antennae extend from the midsection of the satellite.

The satellite carries instrumentation to measure the total cosmic ray intensity, density of meteoric matter in the satellite's orbit, and measurements of temperature within the satellite and at its skin.

Two radio transmitters are carried. One radiates approximately 60 milliwatts of power on 108.030 mc. The batteries used should keep it in operation for approximately two weeks. The other transmitter, radiating 10 milliwatts of power on 108.000 mc., the primary tracking frequency, is designed to operate for approximately two months. Both transmitters telemeter data on instrument readings. The Minitrack network, and a supplementary system, Microlock, are tracking the satellite and receiving telemetry signals.

Although visual observations from the United States were not expected until the satellite drew closer to the earth, a telescopic sighting was reported by a Moonwatch team at Alamogordo, N. M., on Saturday, February 1, and a naked-eye sighting by a Moonwatch team in Manhattan, Kans., on Sunday, February 2. The Manhattan team estimated the satellite to be as bright as a fifth-magnitude star.

The orbit of 1958α is inclined at an angle of 33.58° to the equator, the perigee is 219 statute miles, the apogee is 1587 statute miles, and the period is 114.95 minutes.

Both the United States and U.S.S.R. satellite programs call for further attempts to launch additional satellites over the coming months. These will be employed in the direct observation of upper atmosphere phenomena, processes and conditions. Data will be gathered on radiations in the Lyman-Alpha region of the solar spectrum, on cosmic ray intensity, on micro-meteoritic erosion, earth's magnetic field, atmospheric density and temperature, and will extend even to effects of radiation and low gravity upon living organisms. Observations will be coordinated with those made through the use of ground-based balloon and rocket programs.

The Academy's Program for Placement of Hungarian Scientists

EDMUND C. ROWAN [1]

Assistant Director, Office of International Relations

THE RECENT announcement of the termination of the "parolee" program for Hungarian refugees [2] comes slightly more than one year after the dramatic fight by the Hungarian people for freedom in their own country. Following the heroic revolution of October 1956, some 200,000 Hungarians were obliged to flee Hungary because of their activities in behalf of freedom and aspirations for a better life. Approximately 38,000 of these people have come to the United States in the hope of establishing new lives in an atmosphere of freedom from fear.

The termination of the parolee program marks a turning point in the Academy's activities in behalf of Hungarian scientists and gives us the opportunity to examine the achievements of the past year, to establish certain conclusions as a result of our experience, and to make possible suggestions for the future.

It may be recalled that in November 1956, the National Academy of Sciences formally resolved to accord assistance to its Hungarian colleagues who might come to the United States, recognizing this as the minimum assistance due those who risked their lives in behalf of the fundamental principles of freedom. In an earlier article in NEWS REPORT (*see* Vol. VII, No. 3, pp. 33–40, 1957), Dr. Wallace W. Atwood, Jr., and Dr. M. H. Trytten, the Co-Directors of the program, described the Academy's program at Camp Kilmer and in Vienna and the results obtained during the first six months of operation.

By May 1, 1957, when Camp Kilmer was closed and President Eisenhower's Committee for Hungarian Refugee Relief was deactivated, the majority of the 38,000 refugees destined to come to the United States had already arrived and been resettled. However, refugees continued to arrive at the new reception center in the Hotel St. George, Brooklyn, N. Y. Although fewer in number, the flow remained significant and contained a relatively high proportion of people with talents in the natural sciences, medicine, and engineering. Many of those who had been interviewed by the Academy's team in Vienna during April and May also began to arrive in New York. Still later, a trip to Yugoslavia in behalf of the U. S. Immigration and Naturalization Service by Dr. John Gergely of Massachusetts General Hospital and Dr. Alex Mayer of the Massachusetts Institute of Technology resulted in assistance to additional Hungarian scientists. During the autumn of 1957, the Academy found that it also could assist some of the Hungarian refugee scientists who had found only temporary haven in Western European countries.

As the newcomers from these sources arrived at the Hotel St. George, they were formally processed by the immigration authorities, their respective sponsoring agencies, and assisted by the Red Cross. The Academy's staff in the St. George under the direction of Dr. Maria E. Steller, with the collaboration of the staff in Washington and the invaluable assistance of numerous colleagues at universities and in industry in the New York area, matched the newcomers' individual personalities, aspirations, capabilities, and numerous personal problems with positions in the academic or industrial world of the United States which would enable them to contribute their par-

[1] Mr. Rowan is Assistant Director of the Academy's program for Hungarian refugee scientists. He opened the Academy's office at Camp Kilmer on December 19, 1956, and initially was in charge of the office at Hotel St. George in Brooklyn, N. Y.

[2] Except for the first 6,500 admitted, the Hungarian refugees, being neither visitors nor permanent resident aliens, entered the United States on parole. This anomalous status will remain until adjusted by an Act of Congress.

ticular talents to the fabric of our society.

In addition to the extensive interview by an Academy staff member, in most cases the newcomer was sent to an American colleague in the same special field for an "interview in depth," counseling, and an evaluation of his capability. Often the American colleague was able to suggest specific industrial or academic openings in the refugee's field. At this point our staff member would discuss these specific possibilities with the case officer in the refugee's sponsoring agency, such as the International Rescue Committee, or one of several religious agencies. The requirements for suitable employment were integrated with those of housing, initial community assistance, religious considerations, and personal predilections. Then the appropriate person at an industrial laboratory or university department was contacted and a personal interview arranged. The Academy office made travel arrangements and financed travel costs, which usually were refunded by the industry visited. Typically, one or two personal interviews culminated in employment or acceptance at a university, although very often the escapee scientist was accepted sight unseen on the basis of the evaluation of him. It is noteworthy that in several disciplines there were many more offers of employment for highly qualified persons than there were refugee scientists to fill them.

The language barrier was overcome in a number of ways: by industry, through locally arranged language instruction or utilization of German, through community and university projects, and by formal language fellowships for those of especially promising academic caliber. Frequently the Academy offered the newcomer an interest-free loan for 90 days to sustain him until he received his first paychecks. The early and unprompted repayment of the loans has enabled the same service to be extended to those arriving more recently. An important and greatly appreciated service to the newcomer was discussion directed toward planning his career; this covered such matters as salary scales, prospects for further training, the structure of academic and professional organizations in this country.

During the course of the operation, the Academy staff personnel was too preoccupied day and night to be concerned with keeping score of the number of refugees interviewed and placed. Indeed, the staff recognized from the beginning that it was dealing with individuals and that it mattered little which organization achieved actual placement so long as it was professionally adequate and utilized the newcomers' professional talents. Building a high score of placements by the Academy itself was not an objective of the program. Instead, emphasis was placed upon helping as many individuals as possible, paying special attention to those highly qualified. This often was accomplished by counseling and referring a refugee to another American organization more closely related to the individual's special field. Ideally the interviewing and placement of refugees could best be accomplished by an American professional society devoted to the same profession as the refugee. Because there were no such organizations at Camp Kilmer, the Academy's office was asked by the President's Committee for Hungarian Refugee Relief to assist other professionals such as lawyers, practicing physicians, social scientists, etc.

Table 1 presents a tabulation of placements from the beginning of the Academy's program late in December 1956 until the termination of the parolee program on December 31, 1957. Because registration with the Academy's office was entirely optional, an undetermined number of scientists among the refugees are not included in the figures shown in the table.

While it is still too early to evaluate the magnitude of the contribution which the newcomers are making, from numerous reports it appears that the vast majority seem pleased with their new positions and several have participated in the solution of particular research problems at both industrial and academic laboratories. A score or more of those with scientific and technical talents also are satisfactorily serving with various research organizations of the federal government, including those of the military services. As a result of a more comprehensive survey, it soon will be possible to publish details of the distribution

and positions of those assisted under the program.

TABLE 1.—Placement of Hungarian refugee scientists tabulated by professional fields.

Professional field	Direct Placement	Counseling and Placement Assistance[1]	Interviewed or Counseled Only[2]	Total
Chemical engineering	71	26	4	101
Electrical engineering	39	17	3	59
Civil engineering	37	21	30	88
Mechanical engineering	71	50	13	134
Other engineering	21	23	4	55
Medicine	108	82	28	218
Chemistry	21	11	0	32
Mathematics and physics	26	9	5	40
Other natural sciences	34	32	4	59
Other professions (social science, law, etc.)	51	88	44	173
Technicians	36	44	32	112
Total	515	416	150	1,081

[1] Includes those who were placed in cooperation with other organizations or societies and those whose placement was largely consummated before arrival in the United States.

[2] Includes those who departed from Camp Kilmer before assistance could be arranged, those who had substandard qualifications, a few who had personality problems which made placement difficult, and some whose special talents tended to be applicable only to Hungarian institutions.

It would be impossible to give a full list of American institutions which deserve credit and appreciation for their assistance. But special recognition is due the Rockefeller Foundation which has provided substantial support for the Academy's program, and the American Council for Emigres in the Professions (ACEP) which on a continuing basis has worked closely with the Academy's staff. The ACEP maintains offices at 62 West 45th Street in New York City and continues to offer assistance in placing qualified emigres.

During a period of shortage of scientific and academic manpower in the United States, it was particularly gratifying to see that some hundred and forty persons were accepted at the graduate level by more than thirty-five universities across the country. Although most of these were financially assisted by the universities concerned, the Academy awarded 18 fellowships supported by the Rockefeller Foundation. In addition, 50 refugees considered of special academic or research promise attended English language courses arranged by the Academy in cooperation with Rutgers University and later at New York University and other institutions. Although there was great variation in the facility with which fluency in English was acquired, in most instances the 8- to 10-week language course enabled the refugee to assume a research position without significant difficulty in communication. Teaching responsibilities of course required additional language preparation.

At the undergraduate level the Institute of International Education with the cooperation of Bard College, St. Michaels, and others, conducted English language courses for 660 Hungarian students. In all nearly 800 undergraduate students who arrived from Hungary after the October Revolution are now attending some 300 to 400 American colleges and universities. This has been made possible through the good offices and assistance of the individual institutions, the World University Service, and the Institute of International Education. Well over 600 of these students are pursuing engineering, science, and medicine at various undergraduate levels. If but a fraction of these Hungarian students follow in the footsteps of the Tellers, Von Neumanns, and Szent-Györgyis, their contribution to this country will be incalculable. However, unless financial aid is forthcoming, many promising students will be unable to pursue their academic training further. It is hoped that appropriate support will be found for these potential scientists and future citizens of the United States.

The philosophy of the Academy's program is not to accord a special advantage to the newly arrived refugee scientist or engineer, but rather to eliminate some of the special obstacles confronting the refugee who arrives without resources, friends, or contacts, and who often has no knowledge of the English language and lacks familiarity with the procedure for finding a position in his profession in this country. The scientist who is a regular immigrant usually is able to make arrangements in advance. The objective of the Academy's program is to enable the newcomer to become integrated into his local and professional community as rapidly as

possible, in order to enable him to contribute his special talents to our society at the earliest possible time. The sooner that the newcomer becomes familiar with the nuances of his profession in this country and the sooner that he establishes contacts with colleagues in his field and in turn is evaluated by them, the sooner he becomes integrated, happy, contributive, and able to compete for normal opportunities. How the newcomer fares during his first months probably constitutes the impression which he gives his scientific colleagues abroad of the prospects for talented immigrants in the United States. It may be worth observing that of the some 330 Hungarian refugees who decided to return to Europe, none had been placed by the Academy.

Several special problems have been encountered in the program. Medical doctors, doctors of veterinary medicine, dentists, teachers, in fact all those who require licensure by the various states, are often confronted by varying requirements, such as graduation from an American university and citizenship. The parolee status held by most of the Hungarian refugees in the United States naturally was unforeseen by those who drew up the various states' licensure requirements. As a consequence, most of the refugees in this category are not yet eligible to apply for the various examinations, successful completion of which would enable them to practice their professions and contribute their special talents in this country. In addition, the foreign trained physician finds it exceedingly difficult to sustain himself and his family on an intern's salary keyed to the requirements of the young American graduate who is usually free of family responsibilities and who may have other sources of income.

Although one objective of the Academy's program is to help the newcomer become competitive with his American colleagues for normally existing opportunities, it has become apparent that a very limited number of fellowships are available to permanent resident aliens and virtually none for parolees. Yet these persons are presumed future citizens. The parolees are ineligible for the fellowship opportunities which exist for both American citizens and visitors from abroad. Except for the temporary opportunities especially created for the Hungarian refugees, virtually no fellowships exist for parolees and permanent resident aliens. This situation militates against the best interests of the country, because many promising young scientists among the refugees who look forward to becoming citizens, will be unable to continue education which would prepare them to contribute their special talents to this country.

Those staff members who were immediately concerned with the Academy's Hungarian Scientists Program formed certain conclusions as a result of their experience. Among these is that the major technical universities of Hungary, although under Communist domination for the last decade, continue to turn out very well-trained young scientists. For example, allowing for individual differences, it has been estimated that the graduate from the Polytechnical University of Budapest or the Science Department of Péter Pázmány University (later renamed Eötvös Lorant University) have received training equivalent to a level between the bachelor's and master's degree of the better universities of the United States. It could also be concluded that the enforced instruction in Marxism and the Russian language usually had an effect contrary to that which was hoped for by the Communist leaders. Although most of these people had encountered the experience of revolution, escape from Hungary, separation from loved ones, continued uncertainty regarding a future, they presented surprisingly few practical personality problems. Being met and treated as equals by their American colleagues had a visibly comforting and reassuring effect.

Apart from being amazed by the continuous flow of much highly qualified talent from a relatively small country, members of the staff also were interested in the general intellectual attitude of the newcomers from Hungary. Most of the people interviewed possessed considerable awareness of social and political issues and a more than basic knowledge of the humanities which they traditionally were taught to consider as essential premises to learning. They also tended to regard science as a method of approach as well as a subject of study. These

attitudes were strongly reflected in their choice of recreation and hobbies, blending a career in natural sciences with interest in music, fine arts, and literature.

Above all they brought a fresh appreciation of freedom, an appreciation acquired only through the experience of having lived under Communist domination for ten years. These people are the *doers* as well as the contemplators. In keeping with the best traditions of earlier immigrations to our country, they bring a new blood, enthusiasm, and aspiration.

Certain observations and recommendations concerning the future may be in order. First, it should be made clear that termination of the parolee program in no way changes the customary and special opportunities for immigration to the United States. The "first preference" mechanism which enables a university, industry, or hospital to bring in qualified immigrants is a regular feature of our immigration laws, but within recent years it has been utilized only to about 5 percent of the extent authorized by existing legislation. The district offices of the U. S. Immigration and Naturalization Service and the United States consular officers abroad are in a position to give the necessary details of this procedure. Furthermore, recent legislation (Public Law 85-316) allocates an additional 15,000 visas to escapees from Communist countries in Europe, including Hungary. Doubtless, those who come to the United States under this legislation will include many with special qualifications in science, engineering, and medicine.

Those associated with the Academy's Hungarian Scientists Program have found the entire experience both challenging and rewarding. It has been a source of inspiration to see the refugee, weary and harassed upon arrival, soon become happily settled in job and home. More significantly, at a time when the United States is embarking upon a long-term program to satisfy its shortage of scientific personnel, the rapid assimilation of great numbers of scientists from abroad, already well-trained, can only be considered a legacy of the first order. The Academy hopes to continue indefinitely to assist refugee scientists who seek opportunities in the United States.

SCIENCE NEWS

CONTINUATION OF VISITING SCIENTISTS PROGRAM

The National Academy of Sciences–National Research Council has been administering for the International Cooperation Administration (ICA) a visiting scientists program under which over two hundred young scientists at the post-doctoral level have been brought to the United States for two years of basic research experience in American universities. Recently, ICA asked the Academy–Research Council to continue the program and to extend it to other countries around the world. The expanded program will bring approximately one hundred and fifty young scientists to the United States and will serve essentially the same purpose as the original program. It will, however, now bring young scientists from countries in Asia, Africa, and South America, as well as from Europe.

The program will be administered by the Office of Scientific Personel with the cooperation of the Office of International Relations and the Pacific Science Board. Representatives of these three offices of the Academy–Research Council soon will visit the countries cooperating in the program for the purpose of developing mutually acceptable procedures whereby the scientific academies or equivalent institutions in these countries may assist in the selection of candidates possibly by establishing committees for that purpose. A more detailed announcement of the program will be made following completion of these visits.

Walter F. Colby, who has served as Assistant to the Director of the Office of Scientific Personnel for the Foreign Research Scientists Program, will continue to direct the expanded program for visiting scientists.

LECTURE BY E. NEWTON HARVEY

The second in the current series of Academy–Research Council afternoon lectures was given on November 26, 1957, by E. Newton Harvey, Professor Emeritus of Princeton University, who spoke on "Evolution and Bioluminescence." This illustrated lecture might well have been given the subtitle, A Survey of the Production of Light by, in, or on Certain Plants and Animals, because luminescence, Dr. Harvey said, is found in certain bacteria, fungi, protozoa, and in multicellular animals both invertebrate and vertebrate.

The appearance of luminescence in so many diverse forms puzzled Darwin, who did not attempt to account for the evolution of light production. According to Dr. Harvey, much has been learned about the chemistry of bioluminescence since Darwin's time, but the evolutionary pattern is still obscure. It would seem that bioluminescence has arisen independently in different phyla, starting with a luminous spot. Then various mechanisms have developed to make this luminosity useful to the organism. In closely related animals one species may be luminous; another not. The great majority of luminous animals live in salt water. Only one fresh-water animal, a snail, is known to be luminous. No parasites are luminous and only one cave animal produces light. Although light appears in certain deep-sea fishes, it is not found in those that live in the depths of fresh-water lakes. Terrestrial luminous insects are well known.

Bioluminescence is a subject that lends itself well to visual illustration, and Dr. Harvey made the most of it. He showed more than thirty pictures, some of which were taken by light from the organisms themselves. His slides served to illustrate various features of bioluminescence; for example, the diversity of forms in which luminescence appears and the fact that animals may be self-luminous or may emit light from luminous bacteria living in or on them. A most amazing example of bacterial symbiosis was shown in a fish that has a white spot under the eye. This white area contains bacteria that luminesce continuously, but the fish can control its bacterial headlights for it is provided with a black fold of skin which is drawn over the luminous spot like an eyelid. Some slides illustrated forms that have proved useful for chemical and physiological investigations on bioluminescence, such as the single-celled *Noctiluca,* which emits light from certain granules in the cell only when stimulated; and *Cypridina,* a crustacean that produces extracellular luminescence from glandular secretions.

Dr. Harvey called attention to the importance of modern instrumentation in studying the characteristics of light produced by living organisms. He showed an example of an emission spectrum—wave length of light from the luciferin-luciferase reaction versus its intensity. He illustrated three general classes of chemical reactions behind bioluminescence. Finally he demonstrated light production by grinding dried *Cypridina* and mixing the powder in water in a large flask. Blue light was emitted by the mixture. An even more brilliant display of light of non-biological origin was produced in another flask when hydrogen peroxide was added to an organic compound in aqueous solution.

Those desiring further information about this interesting topic should read the introductory chapter of the Proceedings of the Conference on the Luminescence of Biological Systems, written by Dr. Harvey and published by the American Association for the Advancement of Science in 1955.

MARITIME CARGO TRANSPORTATION CONFERENCE

The fifth annual meeting of the Board of Advisors of the Maritime Cargo Transportation Conference was held on December 4 in the Academy–Research Council building. The total attendance of 45 included 14 Board members, the Conference staff, liaison personnel, consultants, and guests representing governmental, industrial, and academic activities in fields related to maritime cargo transportation.

Vice Adm. E. L. Cochrane, Chairman of the Advisory Board of the Maritime Cargo Transportation Conference, presided at the meeting. The various activities of the Con-

ference were covered by a series of reports presented by staff members with discussion by the Board. C. R. Denison, Coordinator of Research for the U. S. Maritime Administration, gave a short résumé of the status of Maritime Administration research.

A major portion of the agenda was devoted to the San Francisco Port Study. After Rear Adm. E. G. Fullinwider, Director of the Conference, outlined the objectives and procedure of the study, the following detailed reports were presented: *1*) A description of the over-all concept of the San Francisco Port Study; 2) An analysis of stevedoring records on a port-wide basis, aimed at isolation of major variables and at assisting the port in setting up accurate index systems for measuring a true change in productivity; 3) the detailed analysis of stevedoring operations by use of motion- and time-study techniques; and *4*) the over-all analysis of the port as a system, embodying two techniques: empirical, involving direct utilization of past information; and mathematical model, formulating the fluctuation of ship arrivals and their demands for longshore gangs.

The remaining presentations were concerned with the nature and progress of other Conference projects. In connection with the Roll-on, Roll-off Study, a description was given of the method for determining trailership construction and operating costs, and "optimum-fleet" calculations. The work of the Shipboard Crane Evaluation Project was summarized in a report of the controlled and in-service tests of shipboard equipment conducted by the Conference for the U. S. Maritime Administration. This was followed by an enumeration of specific research areas to be investigated in the Containerization Study. The nature and scope of the Conference's most recent publication, "Containerization in Maritime Transportation of General Cargo—A Partial Bibliography," was described briefly.

The meeting ended with an outline of plans for the Conference's second Maritime Research Symposium to be held on February 13 and 14. One session will consist of formal presentation and discussion of six research papers, while the second will be devoted to informal correlation and mutual criticism of research plans and techniques.

HIGHWAY RESEARCH BOARD ANNUAL MEETING

The 37th annual meeting of the Highway Research Board, held in Washington, January 6–10, set new record highs in both attendance and representation of participants, and it was again necessary to meet outside the Academy–Research Council building to accommodate the 2,025 registrants attending the concurrent committee meetings and technical sessions.

Approximately 300 authors from various state highway departments, colleges and universities, federal agencies, trade associations, manufacturing companies, highway consulting groups, foundations, county and municipal highway departments in the United States and Canada presented 229 papers and discussions during the course of the 45 technical sessions. In addition, there were 77 committee meetings scheduled by the six departments of the Board during the week.

Due to the expanded highway program considerable emphasis was given to economic analysis of highway networks as the proper approach in planning and design. Arguments were presented favoring the "rate of return" method, widely used in industry as being a sound approach. Traffic trends on rural highways show that in about two-thirds of the cases investigated the actual increases were at rates of more than two times greater than had previously been predicted. Highway location and design is greatly facilitated by the use of photogrammetry. New plotting equipment has been developed to produce more accuracy in horizontal and vertical distances in mapping. This permits more accurate methods for obtaining cross sections and other forms of terrain data for the determination of earthwork quantities. The use of electronic computers and other instrumentation devices are rapidly being exploited in this work.

The Committee on Economics of Motor Vehicle Size and Weight in a progress report described in detail the tonnages and shipping densities of the commodities moved by line haul highway freight. The data show that a preponderance of the general freight lies in the range of shipping

densities between 25 pounds and 50 pounds per cubic foot.

A prestressed concrete pavement, 5 inches thick, 12 feet wide, and 530 feet long, constructed as an experiment has provided sufficient technical data on structural action and information to justify construction of a full size highway experimental installation under heavy traffic conditions. Several states reported on experimental sections of continuously reinforced pavements varying in age from 1 to 10 years. Certain aggregate combinations in pavements tend to polish under high volume traffic and thus produce slippery conditions when wet. Methods have been developed for rapid measurement of pavement skidding resistance on both wet and dry pavements. A resinous material has been produced to apply to surfaces of low skid resistance and thus alleviate the condition. Several agencies reported that concrete in pavements and structures is being successfully evaluated by pulse velocity tests with the soniscope and that good flectural and compressive strength relationships have been established by this test method. The use of silicones is reported to be beneficial in reducing surface absorption of salt solutions used for ice control, thus increasing structural durability.

The papers in the field of traffic covered pertinent subjects such as the effect of periodic refreshment pauses on driver performance, economic cost of traffic accidents, driver-vehicle behavior and effects on traffic flow, evaluating trip forecasting methods with an electronic computor, night vision studies, and efforts to improve visibility in fog. One interesting paper described an electronic system that provides automatic control of vehicles on the highway. The basic elements of one such system have already been developed and were recently tested and demonstrated successfully in cooperation with the State of Nebraska. The system consists basically of a series of electronic detector units buried in and along the highway and a guidance cable buried in the center of a traffic lane along the length of the road. The detector units, in which signals are generated by the passage of vehicles, are used to activate various systems of warning lights and can eventually be combined with simple receivers and automatic equipment in vehicles to control speed and braking. The guidance cable radiates a constant signal which is employed in conjunction with a car receiver and automatic steering equipment to keep the vehicle centered in its traffic lane. The system includes provision for a radio "tail warning" that extends any desired distance behind each passing vehicle to warn or control following cars equipped with receivers or to operate warning lights along the roadside.

Reports in the realm of soil mechanics dealt with landslide occurrence, consolidation studies, frost action, soil surveys, nuclear measurement of density, swell pressures and stabilization, just to mention a few.

A perennial highlight of the meeting was the presentation of awards. The Roy W. Crum Award for distinguished service was conferred upon Edward H. Holmes, Assistant Commissioner for Research in the U. S. Bureau of Public Roads. The Highway Research Board Award for the best technical paper delivered at the previous annual meeting was presented to George M. Webb and Karl Moskowitz, both of the California Division of Highways, for their paper on "Freeway Capacity Study—1956."

NEW APPOINTMENT MATERIALS ADVISORY BOARD

The Division of Engineering and Industrial Research has appointed Alvin J. Herzig, President of the Climax Molybdenum Company, Chairman of the Materials Advisory Board to succeed John R. Townsend, who has been made Special Assistant to the Assistant Secretary of Defense for Research and Engineering. Mr. Herzig has served as a member of the Materials Advisory Board since its establishment in 1950 as the Metallurgical Advisory Board and has headed some of its major subgroups on specific projects and surveys. He has been a member of the National Research Council assigned to the Division of Engineering and Industrial Research where he represented the American Society for Metals since 1955 and is now serving a second term as a member of the Division's Executive Committee.

NEW APPOINTMENTS MARITIME CARGO TRANSPORTATION CONFERENCE

Two new members have been appointed to the Board of Advisors of the Maritime Cargo Transportation Conference: Cyrus S. Ching, nationally known labor relations expert who has served the Federal Government on many occasions; and Vice Adm. M. L. Royar, U. S. Navy (ret.), who had been a member of the original board while he was Chief of the Bureau of Supplies and Accounts, U. S. Navy.

LECTURE BY WILLIAM D. McELROY

On Tuesday, January 21, William D. McElroy, Professor of Biology and Director of the McCollum-Pratt Institute at The Johns Hopkins University, delivered the third lecture in the 1957–58 Academy–Research Council series. Dr. McElroy chose as his subject "Trace Elements in Biology and Agriculture."

A number of inorganic elements or minerals are required by all living forms for normal growth and reproduction. The fact that virtually all the elements of the periodic table have been found in living cells does not necessarily mean that all are essential to life. The inorganic, or mineral, nutritional requirements of living organisms are generally divided into two classes, the major or *macronutrient* elements, needed in relatively large amounts, and the *micronutrients*, or trace elements, required in only very small amounts. For most organisms the macronutrient elements include sulphur, phosphorus, potassium, magnesium, calcium, nitrogen, sodium, and chlorine. The trace elements include iron, zinc, manganese, and copper. Molybdenum, boron, and vanadium are also needed for plants; and iodine, cobalt, and probably molybdenum for animals.

The fact that the trace metals are needed in only small quantities indicates that they are functioning in some catalytic role, usually as part of an enzyme system. In this respect the function of trace elements is similar to that of the organic micronutrients, the vitamins. A known enzymatic role has already been described for most of the trace elements, except iodine, which is a component of the thyroglobulin molecule and cobalt, which is part of the vitamin B^{12} molecule. Non-essential metals also have a significant effect on the metabolism of plants and animals, and there are many examples of multiple metal effects on enzyme systems. As judged by the optimum concentration of an element for enzyme activity as well as the ratio of stimulatory and inhibitory metals present, it is evident that under physiological conditions some systems may be working at a maximum rate whereas others may be operating at less than 1 percent of maximum efficiency. Obviously there must be some balance in the soil, in the plant and in the animals which lead to a normal healthy individual. Deficiencies and excesses are a matter of degree, and plants, like animals, may become decidedly inferior in quality long before showing outward signs of such. In other words, yield and growth are no longer adequate signs of a normal healthy individual. The enzymatic patterns are the real test, and determination of enzymatic activity will certainly be of value in the early diagnosis of animal and plant diseases that are not apparent from growth studies.

Current research is not much concerned with proving that this or that trace element is essential in nutrition but rather with the elucidation of the mechanism of these elements in enzyme systems. It appears that copper, iron, zinc, and molybdenum function as electron mediators in oxidation-reduction reactions. The important biochemical questions are: *a*) why, in combination with specific proteins, is this capacity for catalyzing oxidation-reduction reactions accentuated, and *b*) what is the nature of the linkages which allow specific coupling of these metal systems to others, allowing the transfer of electrons along specific pathways? The pattern which seems to be emerging is that these metals are not required specifically for the combination of substrate to the catalytic protein, but rather function primarily as "electron couplers" from one protein system to another.

Tabulated results thrown on the screen showed that magnesium and, to a certain extent, manganese are required primarily for those reactions involving group trans-

fer, in particular those in which phosphate participates. In recent years it has become increasingly clear that enzymes participate intimately in group transfer by serving as the intermediate carrier. Magnesium plays a predominant role in promoting the formation of the enzyme-substrate complex and the resulting intermediate of the reaction. The presence of a pyrophosphate structure in many of the cofactors and substrates involved in group transfer suggests that a chelate structure with magnesium is probable.

Dr. McElroy also talked about the role of manganese in enzymatic decarboxylation, and other complex subjects of current research interest.

U.S. AIR FORCE SUMMER STUDY PROGRAM

Under the directorship of Theodore von Kármán, internationally known authority on aerodynamics, a group of more than a hundred scientists and engineers within the Academy–Research Council is studying long-range research and development trends and objectives for the U. S. Air Force. The group began its work last summer with a two-month concentrated review of many scientific and technical fields related to advanced aerial systems and submitted an interim report on its findings and recommendations to the Air Force on November 22, 1957.

The study was initiated at the request of the Air Research and Development Command of the U. S. Air Force and is being conducted under a contract with that organization. It will continue with another intensive period of study during next June, July, and August at the Whitney Estate, Woods Hole, Mass., which proved such an effective location for the Academy–Research Council's Nobska project in 1956.

The efforts of the current study group were directed toward two basic objectives: *a*) to review existing Air Research and Development Command long-range plans in order to provide immediate guidance on important programs; and *b*) to gain more detailed insight into those operational and scientific problems of the U. S. Air Force which must be considered in preparing a meaningful outlook for future possibilities.

To organize for its task, the group divided into eight technical committees as follows: *1*) aircraft; 2) guided missiles and space vehicles; 3) propulsion; *4*) electronics, guidance and control; 5) materials; *6*) weapons; *7*) life sciences; and 8) geophysics. The work on materials was carried out by a special committee of the Materials Advisory Board under the direction of J. R. Townsend, former chairman of the Board.

In addition to the work of the technical committees, cross fertilization of ideas was encouraged by means of joint committee action in the following three areas: reconnaissance, future intercontinental bombing systems, and defense against the I.C.B.M. The views and recommendations of those joint committees, as well as the summary reports on the technical areas outlined above were supplemented by an extensive series of monographs written by individual members of the group and containing detailed discussions of particular scientific interest to the author's participation in the study.

Besides Professor von Kármán, other members of the Academy who participated in the study were Detlev W. Bronk, *President;* Hugh L. Dryden, *Home Secretary;* H. W. Bode, Robert B. Brode, J. P. Den Hartog, Charles S. Draper, Wallace O. Fenn, Paul J. Flory, George Gamow, David T. Griggs, H. K. Hartline, Zay Jeffries, Joseph Kaplan, George B. Kistiakowsky, Edwin M. McMillan, William Shockley, Charles H. Townes.

In transmitting the initial report to the Air Force, Dr. von Kármán said:

> While no one in the group would pretend that we looked at all the vital technical questions, we do feel that we have prepared some remarks that are now of considerable importance to the development of air power in this country: possibilities for satellite reconnaissance, new propulsion systems, future trends in electronics, and the changing role of man in aerial weapons systems—to mention only a few. There is a need to go on from here to find out those areas which have not already been covered. This can be done by exploring further the relationship between scientific and technical progress and Air Force missions, and defining a more comprehensive system of recommendations embracing the entire field of our assignment. It is my hope that we shall be able to fulfill such undertakings to the satisfaction of our national security.

COMMITTEE ON TISSUE TRANSPLANTATION

For many years the Division of Medical Sciences has followed closely the progress being made in the replacement of lost, damaged, or diseased tissue—first because of its special interest in military surgery, and later because of the growing possibility of application in broad areas of civilian medicine as well. Success has been achieved with artificial implants of metal or plastic and also with preserved grafts of human and animal tissue, which do not themselves survive but form a framework for the growth of new tissue by the host. Except in the case of identical twins, or of relatively inert tissue such as the cornea, true transplantation of living tissues into human patients, the ultimate goal, is still unrealized.

Research on this problem, encompassing both fundamental and clinical investigation, is one of the most exciting areas of current medical science. Already tissues have been successfully transplanted under certain circumstances between animals, even of different species, and embryonic tissue has been transplanted to unrelated adult animals. Some are encouraged to visualize such possibilities as the correction of hormonal deficiencies in humans by glandular grafts, perhaps even grafts of embryonic tissue grown in tissue culture reservoirs.

This research involves a formidable range of scientific disciplines: immunology, genetics, biochemistry, physical chemistry, microbiology, radiology, pharmacology, and surgery contribute independently and in concert. The objective is an understanding of the process that causes one individual to reject tissue transplanted from another, the methods by which this process can be altered and controlled, and ultimately, the successful application of tissue transplantation in surgical practice.

After consultation with interested agencies, particularly the U. S. Navy which is actively developing a tissue bank program, and an exploratory meeting last spring, the Division has appointed an ad hoc Committee on Tissue Transplantation to deal with current requests for advice and to provide a focus for future developments in this rapidly growing field. E. J. Eichward, Director of the Laboratory for Experimental Medicine at the Montana Deaconess Hospital and editor of *Tissue Transplantation Bulletin*, has accepted the chairmanship. The other committee members are as follows:

Glenn A. Algire, National Institutes of Health
Charles C. Congdon, Oak Ridge National Laboratories
Michael E. De Bakey, Baylor University
Milton T. Edgerton, Jr., Johns Hopkins University
Harry S. N. Greene, Yale University
Comdr. George W. Hyatt, National Naval Medical Center
Elvin A. Kabat, Columbia University
Hilary Koprowski, Wistar Institute
Joseph E. Murray, Harvard University
Ray D. Owen, Oak Ridge National Laboratory (on leave from California Institute of Technology)
Lewis Thomas, New York University

The first regular meeting of this Committee was held on November 21 and 22. A panel composed of representatives of various scientific disciplines examined certain aspects of current research and their significance for tissue transplantation.

NINTH PACIFIC SCIENCE CONGRESS

The Ninth Pacific Science Congress of the Pacific Science Association was held November 18–December 9, 1957, in Bangkok, Thailand, under the auspices of the Thai Government and the Science Society of Thailand. Their Majesties the King and Queen were patrons of the Congress, the Prime Minister of Thailand served as Honorary President, and Air Marshal Muni M. Vejyant-Rangsrisht, Rector of Chulalongkorn University, was President.

The Congress attendance exceeded all estimates with 860 registrants, 500 of whom were from foreign countries. Large delegations attended from the United States, the Philippines, Australia, Malaya, China (Taiwan), Indonesia, Vietnam, Canada, France, the United Kingdom, and Russia. In addition, scientists from Hong Kong, Singapore, India, Laos, the Netherlands, New Zealand, Burma, Germany, Austria, Borneo, Okinawa, the Trust Territory, Switzerland, Denmark, Brunei, Ceylon, Cuba, Sweden, United Nations agencies,

and the South Pacific Commission participated in the meetings.

For the first two weeks scientific sessions were held daily at Chulalongkorn University and included papers and special symposia on the many diverse scientific fields of special interest to the Congress members. One of the most successful sessions was the special symposium on climate, vegetation, and rational land utilization in the humid tropics, organized with special assistance from Unesco under the chairmanship of F. R. Fosberg, U. S. Geological Survey.

Distinguished scientists presented a series of evening public lectures during the Congress. The speakers and their topics were as follows:

"Land and People, the Scientific Background of National Land Planning," L. Dudley Stamp (United Kingdom)
"Better Nutrition through Appropriate Agricultural Planning," L. A. Maynard (United States)
"Wildlife Conservation in Canada," I. McTaggart Cowan (Canada)
"Wildlife of Thailand," Boonsong Lekakul (Thailand)
"Hallucinatory Fungi Used by Indian Inhabitants of Central and South Mexico," Roger Heim (France)
"A Volcanic Eruption in Puna, Hawaii," George C. Ruhle (United States)
"The International Geophysical Year and Its Work," Athelstan F. Spilhaus (United States)

One of the last official acts of the Pacific Science Congress was to accept the joint invitation of the National Academy of Sciences and the Bernice P. Bishop Museum to hold the Tenth Congress in Honolulu in 1961.

A report on this Congress could not be written without mentioning the excellent way in which the Thai Organizing Committee, working with the Standing Committees of the Pacific Science Association, planned and carried out a very successful program for the largest scientific meeting ever held in Thailand. The delegates found Bangkok a city of contrasts with its ancient gilded temples and modern public buildings, its picturesque canals and modern highways, its Buddhist culture and Western technology, together with its unusual jewelry, silks, and textiles, and floating markets of exotic tropical fruits and vegetables. On every hand large numbers of friendly Thai were constantly on the move by foot, boat, bicycle, motor cab, or car. The combination of the scientific program, the generous Thai hospitality, and the Bangkok setting made this a memorable event for those fortunate enough to attend.

INTERNATIONAL UNION OF NUTRITIONAL SCIENCES

Upon recommendation of the American Institute of Nutrition the Academy–Research Council has recently established a national committee to achieve appropriate United States participation in the International Union of Nutritional Sciences. The Union which was formed in 1946 includes 23 countries in its membership. A general assembly of the Union is held every three years in conjunction with the Congress on Nutrition. In September 1960 the United States will be host to the Fifth International Congress on Nutrition which will be held in Washington, D. C., under the sponsorship of the American Institute of Nutrition and the Academy–Research Council.

The present officers and members of the U. S. National Committee are as follows:

PAUL GYÖRGY, University of Pennsylvania, *Chairman*
W. H. SEBRELL, JR., Williams-Waterman Fund of the Research Corporation, New York, *Vice Chairman*
R. W. ENGEL, Virginia Polytechnic Institute, *Secretary*
GERALD F. COMBS, University of Maryland
MILTON O. LEE, Secretary, Federation of American Societies for Experimental Biology
ARNOLD E. SCHAEFER, National Institutes of Health
ELMER L. SEVERINGHAUS, Vice President for Clinical Research, Hoffman-La Roche, Inc.
ELIZABETH NEIGE TODHUNTER, University of Alabama
LEROY VORIS, Executive Secretary, Food and Nutrition Board

Ex-Officio Members (voting)

R. R. WILLIAMS, President, American Institute of Nutrition
C. A. ELVEHJEM, Chairman, Food and Nutrition Board
C. G. KING, President, Fifth International Congress on Nutrition.

Ex-Officio Members (non-voting)

L. A. MAYNARD, Chairman, Division of Biology and Agriculture
R. KEITH CANNAN, Chairman, Division of Medical Sciences
WALLACE W. ATWOOD, JR., Director, Office of International Relations

INTERNATIONAL INSTITUTE OF REFRIGERATION

The Executive Committee of the International Institute of Refrigeration (IIR) met in Paris on November 25 and 26, 1957. Richard C. Jordan of the University of Minnesota attended the meeting as the Academy–Research Council's delegate to the IIR. Dr. Jordan also serves as Chairman of the U. S. National Committee for the IIR.

During the meeting, the Executive Committee elected three Commission Vice Presidents:

CARL F. KAYAN of Columbia University, Vice President of IIR Commission 2—Transfer of heat, thermal properties of materials, instrumentation, and insulating materials

T. B. CHRISTENSEN of North East Cold Storage Corporation in Portland, Me., Vice President of Commission 5—Cold storage and ice-making plants

W. R. WOOLRICH of the University of Texas, Vice President of Commission 9—Education.

Subsequent to the meeting, H. C. Diehl, Director and Secretary of the Refrigeration Research Foundation was appointed Secretary of Commission 4—Applications of refrigeration of foodstuffs and agricultural produce.

MICROFILMING OF CHEMICAL-BIOLOGICAL DATA

Although the activities of the Chemical-Biological Coordination Center have been terminated (*see* NEWS REPORT, Vol. VII, No. 1, pp. 7–8, 1957), every effort has been made to conserve the data collected by the center and to make them available to interested individuals or groups.

Arrangements are now being completed for microfilming data from the following sections of the files:

1) Chemical code sheets of approximately 63,000 compounds with the sheets arranged in serial number order. These sheets contain, in addition to the data indicated under item 3, the chemistry code of the compound and for many compounds physical properties and miscellaneous information, including sources.

2) Biological data code sheets numbering approximately 80,000 containing approximately 220,000 items of biological data. The filing order of these sheets is by the serial number of the chemical compound employed in the test. On each code sheet, in addition to the code symbols of the data, is a complete detailed extract of the biological information.

3) Chemistry cards listing the serial number, molecular formula, structural formula and the *Chemical Abstracts* name of the 63,000 compounds mentioned above. These microfilms are available with the original cards arranged in *a*) alphabetical order of the compound names, *b*) serial number order, and *c*) molecular formula order.

4) Reference cards to publications concerning the effect of compounds on organisms. Most of the articles listed on these cards were not coded by use of the Center's biology code as the lists were compiled prior to development of the code, but some were subsequently coded. Consequently, the data contained in some of the publications listed on these reference cards are also found in item 2.

5) References to miscellaneous publications listed in items 2 and/or 4 but indicated there only by a serial number. These cards are arranged by serial number order and total approximately 5,500 references.

When the microfilming is completed, the Center's original files will be inaccessible for public or private use, but copies of the microfilm and of the IBM punch cards of coded data may be purchased in toto or by separate item.

Additional information on the content of these items listed above may be obtained from George A. Livingston, Acting Director, Chemical-Biological Coordination Center, Academy–Research Council.

GEOGRAPHIC FIELD RESEARCH

Seven young scientists have been awarded contracts for geographic research in foreign areas in the third annual competition under a program sponsored by the Office of Naval Research. The Screening Committee of the Division of Earth Sciences met on December 11 to evaluate the 32 applications which had been submitted.

The following list gives the names of the recipients, their projects, and the length of time to be spent in the field:

ROLAND E. CHARDON, Plantation system in Yucatan, Mexico—12 months
RICHARD A. ELLEFSEN, Expanding dairy industry of the major cities of India—12 months
ALEXANDER R. GASSAWAY, Agricultural geography of the Finnmark Province, Norway—14 months
JAMES HARATANI, Nature fish culture in the Indian subcontinent—14 months
DON R. HOY, Agricultural land use of Guadeloupe, French West Indies—8 months
ALVIN W. URQUHART, Cultural geography of Mocamedes and Huila, Angola—12 months
CANUTE VANDERMEER, Land use in the Island of Cebu, Philippines—12 months.

Thus far under the program a total of 25 young scientists have been given the opportunity to do independent work on topics and in areas of their own choosing where they may make professional contacts of lasting value. For almost all the investigators the reports will constitute doctoral dissertations.

The Screening Committee was composed of George B. Barbour, University of Cincinnati; J. Russell Whitaker, George Peabody College; and John K. Wright, American Geographical Society. Richard J. Russell, Past Chairman of the Division, presided at the meeting.

COMMITTEE ON OCEANOGRAPHY

At the request of the Atomic Energy Commission, the Fish and Wildlife Service of the U. S. Department of Interior, and the Office of Naval Research, the Academy–Research Council has established a Committee on Oceanography. The Committee is composed of the following members:

HARRISON BROWN, California Institute of Technology, *Chairman*
MAURICE EWING, Lamont Geological Observatory
COLUMBUS O'D. ISELIN, Woods Hole Oceanographic Institution
FRITZ KOCZY, Marine Laboratory, University of Miami
SUMNER PIKE, former Commissioner of the Atomic Energy Commission
ROGER REVELLE, Scripps Institution of Oceanography
GORDON A. RILEY, Bingham Oceanographic Laboratory, Yale University
MILNER B. SCHAEFER, Inter-American Tropical Tuna Commission
ATHELSTAN F. SPILHAUS, Minnesota Institute of Technology.

The first meeting of the Committee was held in New York City on November 23, 1957. In the course of the meeting, the following panels were set up: *1*) Panel on New Research Ships, with Columbus O'D. Iselin as chairman; 2) Panel on New Devices for Exploring the Deep Ocean, with Allyn Vine of Woods Hole Oceanographic Institution as chairman; and *3*) Panel on Radioactive Waste Disposal at Sea, with Roger Revelle as chairman. The Panels on Ocean Resources and Basic Research are yet to be formed.

The Panel on New Research Ships held an organizational meeting in Washington, D. C., on January 18. In addition to Dr. Iselin, the chairman, the Panel is composed of the following members:

CLIFFORD BARNES, University of Washington
REAR ADM. L. O. COLBERT, U. S. Coast and Geodetic Survey, ret.
JOHN ISAACS, Scripps Institution of Oceanography
VITO RUSSO, Division of Ship Design, U. S. Maritime Administration
HERBERT SEWARD, Professor Emeritus of Marine and Mechanical Engineering, Yale University

FEDERAL LEGISLATION ON SCIENCE AND EDUCATION

At its meeting on January 17, the Advisory Board on Education devoted much time to a discussion of the several proposals being made for federal support of science and education. As an outgrowth of this discussion the Board drafted the following principles or objectives for legislation:

1) Provide the best possible educational opportunities for all youth, enabling each to develop to his full potential as a responsible, productive, creative citizen.

2) Promote respect for learning and develop a higher regard for academic achievement.

3) Promote good teaching by recruiting able people; provide opportunities for superior teacher preparation; and enhance the status of the profession, financially and otherwise.

4) Provide support for a balanced educational program, recognizing at the same time that science and engineering now require extra effort to re-establish this balance.

5) Strengthen and expand our diversified system of higher education, both public and private.

6) Avoid commitment of extensive funds for programs as yet unproven, for that might prematurely "freeze" an inferior technique or system; alternatively, encourage development of carefully planned experiments including provision for evaluation.

NEW APPOINTMENTS
DIVISION OF MATHEMATICS

Samuel S. Wilks, Professor of Mathematical Statistics at Princeton University, has been appointed Chairman of the Division of Mathematics effective January 1. Dr. Wilks succeeds Paul A. Smith of Columbia University, who will serve as Past-Chairman. Noted for his work in statistical inference and the applications of mathematical statistics to problems in many fields, Dr. Wilks received his Ph.D. in mathematics from Iowa State University in 1931 and started teaching at Princeton University in 1933. He has been President of the Institute of Mathematical Statistics (1940) and of the American Statistical Association (1950) and has also served as editor of the *Annals of Mathematical Statistics* (1938–49).

Long active in the affairs of the Academy–Research Council, Dr. Wilks served as Secretary to the Committee on Applied Mathematical Statistics from 1943–57 and as a member of the Committee on Battery Additives in 1953. He has been a member of the Division of Mathematics since 1951 and is currently a member of the U. S. National Committee for the International Mathematical Union.

J. Barkley Rosser, Professor of Mathematics at Cornell University, has been appointed Vice Chairman of the Division to serve with Dr. Wilks. Known primarily for his work in symbolic logic, Dr. Rosser has a long record of accomplishment in the field of rocket ballistics. He received his Ph. D. in mathematics from Princeton University in 1934. From 1950 to 1953 he was President of the Association for Symbolic Logic. His membership in the Division of Mathematics dates from 1951. At present he is the representative of the Association for Symbolic Logic and a member of the Committee on Revision of Mathematical Tables.

RECORD OF MEETINGS

November	
1	Committee on Nuclear Science Food and Nutrition Board
2	Subcommittee on Carbohydrates, *Evanston, Ill.*
3	American Geological Institute, Executive Committee, *Atlantic City*
4	Building Research Institute, Plastics Study Group Planning Committee
4–6	American Geological Institute, *Atlantic City* Symposium on Saline Water Conversion
5	Committee on Fellowship Selection Techniques Committee on Agricultural Pests
6	American Geological Institute, Board of Directors, *Atlantic City* Federal Construction Council, Operating Committee
6–8	Armed Forces–National Research Council Committee on Vision
7	Federal Construction Council, Task Group on Federal Working Drawings and Specifications
7–8	AASHO Road Test, Instrumentation Panel
8	USA National Committee, International Union of Crystallography, *Pittsburgh*
9	Committee on Biological Chemistry
10	Division of Mathematics, Committee on Travel Grants, *Princeton*
11	Ad hoc Conference on the Atomic Bomb Casualty Commission's Program of Studies on the Effect of Radiation on the Ageing Process in Man
11–12	Committee on Meteorology
12	Roundtable to Plan Conference on Floor Construction
13	Advisory Committee for the Atomic Bomb Casualty Commission Roundtable to Plan Conference on Paints and Protective Coatings
15	Federal Construction Council, Task Group on Selection and Maintenance of Air Filters Advisory Screening Committee on Fulbright Fellowships in Physical Sciences
16	Nuclear Data Project, Advisory Panel Advisory Screening Committee on Fulbright Fellowships in Mathematics Committee on Highway Laws. *Chicago*
18	Advisory Screening Committee on Fulbright Fellowships in Medical Sciences Advisory Board on Education Committee on Fats and Oils

November

18 — Advisory Screening Committee on Fulbright Fellowships in Chemistry and Chemical Technology

18–20 — National Academy of Sciences, Autumn Meeting, *New York City*

19 — Subcommittee on Waste Disposal
Highway Research Board, Subcommittee on Friction Piles, *Chicago*

20 — Federal Construction Council, Task Group on Air Conditioning Design
Subcommittee on Cardiovascular System

20–21 — Advisory Board on Quartermaster Research and Development, Committee on Statistics, *Chicago*

21 — Advisory Screening Committee on Fulbright Fellowships in Engineering and Industrial Research

21–22 — Ad hoc Committee on Tissue Transplantation

22 — Committee on Textile Fabrics, *Natick, Mass.*
Committee on Coordinated Basic Building Research

22–23 — Advisory Screening Committee on Fulbright Fellowships in Biology and Agriculture

23 — Committee on International Scientific Unions
Committee on Oceanography, *New York City*

24 — Organizing Committee for Conference on Mathematics of Quantum Theory, *New York City*

25–26 — Committee on Termites and Decay in Residential Construction

26 — Pacific Science Board, *Bangkok, Thailand*
Panel on Blood Coagulation, *Albany, N. Y.*

27 — Federal Construction Council, Operating Committee

29 — Subcommittee on Trauma

30 — Subcommittee on Shock

30–Dec. 1 — Committee on Animal Nutrition, *Chicago*

December

1 — Committee on Animal Health, *Chicago*

3 — Federal Construction Council, Task Group on Thermal Insulation and Waterproofing Materials for Hot and Refrigerated Piping

4 — Division of Medical Sciences, Executive Committee
Committee Advisory to the U. S. Army Chemical Corps
Federal Construction Council, Task Group on Underground Heating Distribution Systems
Committee on Child Prosthetics Problems, *Los Angeles*
Maritime Cargo Transportation Conference, Board of Advisors

December

4–5 — Conference on Adhesives and Sealants in Building

5 — Steering Committee on Urban Research

6 — Committee on Ship Steel, Project Advisory Committee SR–134
Subcommittee on Carcinogenesis, *New York City*

9 — Division of Engineering and Industrial Research, Executive Committee
Committee on Veterans Medical Problems, *Memphis*
Subcommittee on Water Supply
Plumbing Research Committee

10 — Subcommittee on Food Sanitation

10–11 — Subcommittee on Toxicology

11 — Subcommittee on Food Technology
Screening Committee for Awards for Geographic Field Research

11–12 — Committee on Containers, *Chicago*

12 — Committee on Ship Steel

12–13 — Technical Studies Advisory Committee for Federal Housing Administration
Liaison Panel and Committee on Food Protection, Joint Meeting

13 — Division of Earth Sciences, Executive Committee
Committee on Theory of Traffic Flow, *New York City*

13–14 — Committee on Geography Advisory to Office of Naval Research
Committee on International Exchange of Persons

14 — Advisory Committee for the Cardiovascular Literature Project
Division of Mathematics, Nominating Committee, *New York City*

16 — Advisory Board on Education
Federal Construction Council, Operating Committee
AASHO Road Test, Vehicle Panel
Steering Committee on Urban Research

16–17 — Committee on Toxicology

17 — Toxicological Information Center, Fiscal Sponsoring Committee
Committee on Ship Steel, Project Advisory Committee SR–128
Subcommittee on Atmospheric and Industrial Hygiene

18–19 — Federal Construction Council, Symposium on Underground Heating Distribution Systems

19 — Ad hoc Committee on Dishwashing Machines, *Natick, Mass.*
Committee on Uses of Electronic Computers in Biology and Medicine

26 — Division of Mathematics, Committee on Educational Policy, *Indianapolis*

30 — Building Research Institute, Subcommittee for Seventh Annual Meeting

NEW PUBLICATIONS

Conference Board of Associated Research Councils. Committee on International Exchange of Persons. *Visiting Scholars in the United States (Recipients of U. S. Government Grants under the Fulbright and Smith-Mundt Acts) Academic Year 1957–58.* Washington, 1957. 29 p.

Conference on Linear Algebras, June 6–8, 1956, Ram's Head Inn, Shelter Island, Long Island, N. Y. *Report.* Washington, 1957. (NAS–NRC Publication 502.) 59 p. $1.50.

Education, Training and Utilization of Sanitary Engineers, Conference Report, 1957. Washington, NAS–NRC, Committee on Sanitary Engineering and Environment, 1957. 17 p.

Howell, J. V., and Levorsen, A. I. *Directory of Geological Material in North America.* 2nd ed. Washington, NAS–NRC, American Geological Institute, 1957. (NAS–NRC Publication 556.) 208 p. $3.00.

National Research Council. Committee on Waste Disposal. *The Disposal of Radioactive Waste on Land.* Washington, 1957. (NAS–NRC Publication 519.) 142 p. $1.00.

National Research Council. Highway Research Board. *Agricultural Soil Maps, Status, July 1957. A Revision of Bulletin 22 (1948).* Washington, 1957. (NAS–NRC Publication 543. Highway Research Board Bulletin 22–R.) 109 p., map. $2.00.

National Research Council. Highway Research Board. *Concrete Pavement Construction and Winter Construction of Bridges . . .* Washington, 1957. (NAS–NRC Publication 522. Highway Research Board Bulletin 162.) 19 p. $0.60.

National Research Council. Highway Research Board. *Night Visibility, 1957 . . .* Washington, 1957. (NAS–NRC Publication 523. Highway Research Board Bulletin 163.) 32 p., illus. $0.80.

National Research Council. Highway Research Board. *Proceedings of the Thirty-Sixth Annual Meeting, Washington, D. C., January 7–11, 1957.* Washington, 1957. (NAS–NRC Publication 542.) 834 p. $10.00.

National Research Council. Maritime Cargo Transportation Conference. *Containerization in Maritime Transportation of General Cargo, a Partial Bibliography.* Washington, 1957. (NAS–NRC Publication 558.) 25 p.

National Research Council. Prosthetics Research Board. *The Artificial Limb Program, a Nationwide Plan of Research, Development, and Education toward the Improved Rehabilitation of Amputees, with the Sponsorship and Support of the U. S. Government . . .* Washington, 1957. 29 p., illus.

Owen, W. S., *et al. Brittle Fracture of Mild Steel in Tension at –196 C.* Washington, NAS–NRC, Committee on Ship Steel, 1957. (Serial No. SSC–109, Third Progress Report of Project SR–136 to the Ship Structure Committee.) 34 p.

Shall I Study Geological Sciences? Washington, NAS–NRC, American Geological Institute, 1957. 14 p.

Stevens, Russell B. *Career Opportunities in Biology, the Challenge of the Life Sciences.* Washington, 1957. (NAS–NRC Publication 552.) 63 p. $1.00.

Stout, Arthur Purdy, and Lattes, Raffaele. *Tumors of the Esophagus.* Washington, Armed Forces Institute of Pathology, 1957. (*Atlas of Tumor Pathology.* Section V, Fasc. 20.) 105 p., illus. $1.00. (Available from: American Registry of Pathology, Armed Forces Institute of Pathology, Washington 25, D. C.)

Symposium on Aspects of Deep-Sea Research, National Academy of Sciences–National Research Council, Washington, D. C., February 29–March 1, 1956. *Proceedings . . . William S. von Arx, Editor.* Washington, 1957. (NAS–NRC Publication 473.) 181 p., illus. $1.75.

United States Delegation to the XIXth Conference of the International Union of Pure and Applied Chemistry, Paris, France, July 16 to 25, 1957. *Report to the Secretary of State . . .* Washington, NAS–NRC, 1957. 49 p., illus.

Williams, Morgan L. *Correlation of Metallurgical Properties, V-Notch Charpy Energy Criteria, and Service Performance of Steel Plates from Fractured Ships.* Washington, NAS–NRC, Committee on Ship Steel, 1957. (Serial No. NBS–7, Final Report of Project SR–106 to the Ship Structure Committee.) 43 p.

Notice of Academy Meetings

NATIONAL ACADEMY OF SCIENCES

Annual Meeting, Washington, D. C., April 28-30, 1958

NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL

Governing Board, Washington, D. C., April 27, 1958
Governing Board, Washington, D. C., June 15, 1958

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